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BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a	**)**	
Ameren Missouri's 2nd Filing to Implement	**)**	**File No. EO-2015-0055**
Regulatory Changes in Furtherance of Energy	**)**	
Efficiency as Allowed by MEEIA	**)**	

Rebuttal Testimony of
Tim Woolf

On Behalf of
Sierra Club

On the Topic of
Ameren Missouri's 2016-2018 Energy Efficiency Plan

March 20, 2015

Table of Contents

1. INTRODUCTION AND QUALIFICATIONS 1

2. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS 5

3. OVERVIEW OF AMEREN'S 2016-2018 ENERGY EFFICIENCY PLAN..... 9

4. AMEREN'S PLAN SIGNIFICANTLY UNDERSTATES COST-EFFECTIVE EFFICIENCY OPPORTUNITIES..... 15

5. AMEREN'S 2013 DSM MARKET POTENTIAL STUDY 20

6. AMEREN'S 2014 INTEGRATED RESOURCE PLAN 30

Overview of the IRP..... 30

Analysis of MAP and RAP Portfolios..... 33

Accounting for Environmental Compliance Costs..... 36

Exclusion of Efficiency Programs..... 40

7. MEEIA AND COST-EFFECTIVENESS..... 46

8. RECOMMENDATIONS..... 52

List of Schedules

Schedule TW-1: Resume of Tim Woolf

Schedule TW-2: *Northeast Regional Lighting Strategy: 2013-2014 Update*, Northeast Energy Efficiency Partnerships (October 2013).

Schedule TW-3: Seth Nowak et al., *Leaders of the Pack: ACEEE's Third National Review of Exemplary Energy Efficiency Programs*, American Council for an Energy-Efficient Economy (June 2013)

1. INTRODUCTION AND QUALIFICATIONS

Q. Please state your name, title and employer.

A. My name is Tim Woolf. I am a Vice-President at Synapse Energy Economics, located at 485 Massachusetts Avenue, Cambridge, MA 02139.

Q. Please describe Synapse Energy Economics.

A. Synapse Energy Economics is a research and consulting firm specializing in electricity and gas industry regulation, planning and analysis. Our work covers a range of issues, including economic and technical assessments of demand-side and supply-side energy resources; energy efficiency policies and programs; integrated resource planning; electricity market modeling and assessment; renewable resource technologies and policies; and climate change strategies. Synapse works for a wide range of clients, including attorneys general, offices of consumer advocates, public utility commissions, environmental advocates, the U.S. Environmental Protection Agency (EPA), U.S. Department of Energy (DOE), U.S. Department of Justice, the Federal Trade Commission and the National Association of Regulatory Utility Commissioners. Synapse has over twenty five professional staff with extensive experience in the electricity industry.

Q. Please summarize your professional and educational experience.

A. Before joining Synapse Energy Economics, I was a commissioner at the Massachusetts Department of Public Utilities (DPU). In that capacity, I was responsible for overseeing a substantial expansion of clean energy policies, including significantly increased

ratepayer-funded energy efficiency programs; an update of the DPU energy efficiency guidelines; the implementation of decoupled rates for electric and gas companies; the promulgation of net metering regulations; review and approval of smart grid pilot programs; and review and approval of long-term contracts for renewable power. I was also responsible for overseeing a variety of other dockets before the commission, including several electric and gas utility rate cases.

Prior to being a commissioner at the Massachusetts DPU, I was employed as the Vice President at Synapse Energy Economics; a Manager at Tellus Institute; the Research Director at the Association for the Conservation of Energy; a Staff Economist at the Massachusetts Department of Public Utilities; and a Policy Analyst at the Massachusetts Executive Office of Energy Resources.

I hold a Masters in Business Administration from Boston University, a Diploma in Economics from the London School of Economics, a BS in Mechanical Engineering and a BA in English from Tufts University. My resume, attached as Schedule TW-1, presents additional details of my professional and educational experience.

Q. Please describe your professional experience as it relates to energy efficiency policies and programs.

A. Energy efficiency policies and programs have been at the core of my professional career. While at the Massachusetts DPU, I played a leading role in updating the Department's energy efficiency guidelines, in reviewing and approving utility three-year energy efficiency plans, in reviewing and approving utility energy efficiency annual reports, in convening a working group on rate and bill impacts of utility energy efficiency programs,

and in advocating for market rules to enable energy efficiency to participate in the New England wholesale electricity market.

I also served as a co-chair of the Working Group on Utility Motivation as part of the State Energy Efficiency Action Network, a state- and local-led effort sponsored by DOE and EPA. In that capacity, I worked with commissioners and consumer advocates from around the country to improve the regulatory policies supporting utility energy efficiency programs.

As a consultant, I have reviewed and provided recommendations concerning utility energy efficiency policies and programs throughout the U.S. and Canada, and I have testified on these issues in British Columbia, Colorado, Delaware, Florida, Kentucky, Massachusetts, Minnesota, Missouri, Nevada, Nova Scotia, Québec, and Rhode Island. My work has encompassed all aspects of energy efficiency program design and implementation, including cost-benefit analyses, avoided costs, efficiency potential studies, efficiency measure assessment, program delivery options, program budgeting, utility performance incentives and other relevant regulatory policies.

Additionally, I have been the lead technical consultant for the National Efficiency Screening Project, which is comprised of a team of experts and advocates dedicated to improving the techniques used to screen energy efficiency resources. I have also represented clients on several energy efficiency collaboratives, where policies and programs are discussed and negotiated among a variety of stakeholders, including utilities, commission staff, consumer advocates, and efficiency advocates.

I have worked for a variety of clients on energy efficiency issues, including consumer advocates, environmental advocates, regulatory commissions and other government agencies.

Q. On whose behalf are you testifying in this case?

A. I am testifying on behalf of Sierra Club.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to present my review of Union Electric Company d/b/a Ameren Missouri's (Ameren or the Company) 2016-2018 Energy Efficiency Plan (2016-2018 Plan, Efficiency Plan, or Plan),[1] and the Company's underlying analyses, including analyses presented in Ameren's 2013 Demand Side Management Market Potential Study (Potential Study) and 2014 Integrated Resource Plan (IRP).[2]

Ameren has applied to implement its proposed 2016-2018 Energy Efficiency Plan under the Missouri Energy Efficiency Investment Act (MEEIA), which allows for the implementation of commission-approved demand-side programs with a goal of achieving all cost-effective demand-side savings.[3] I offer several recommendations for how the Plan should be improved to increase the benefits available to Ameren customers and to the

[1] In this testimony, the Plan refers to Ameren's proposed three-year program portfolio. With the exception of the proposed variance from annual demand and energy savings targets, Ameren's proposed technical resource manual (TRM) and demand-side investment mechanism (DSIM) are beyond the scope of my rebuttal testimony.
[2] Ameren's 2013 Potential Study and 2014 IRP are before the Commission in case no. EO-2015-0084.
[3] Mo. Ann. Stat. § 393.1075.

Company, including lower system costs and energy bills due to increased, cost-effective energy savings.

Q. Have you previously testified before the Missouri Public Service Commission?

A. Yes. I provided rebuttal testimony on behalf of the Missouri Office of the Public Counsel regarding Ameren Missouri's 2011 IRP in case no. EO-2011-0271.

2. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Q. Please summarize your primary conclusions.

A. In general, Ameren's 2016-2018 Plan dramatically understates the amount of cost-effective energy efficiency that is realistically achievable, and thus includes energy savings goals and budgets that are way too low. As such, the Plan does not reflect a reasonable pursuit of achieving all cost-effective demand-side savings. To put the Company's proposed Plan in perspective, the projected energy savings (0.4 percent of retail sales per year) are roughly one half of the amount of the savings in Ameren's 2013-2015 Plan (0.5 to 0.9 percent of sales), and are less than half of the reported savings for the last two program years, 2013 (0.9 percent of sales) and 2014 (1.0 percent of sales).[4]

The Company provides three reasons why the savings in its 2016-2018 Plan are so low relative to the savings in its 2013-2015 Plan: (1) the enactment of federal appliance efficiency standards (Federal Standards); (2) 2013 evaluation, measurement and verification (EM&V) measure level savings estimates; and (3) lower avoided costs. (Plan

[4] *See* Plan at p. 16; 2014 IRP Chapter 3, Appendix A at p. 82; and Ameren's Demand-Side Program Annual Report for 2014 (2014 Annual Report), Case No. EO-2015-0210.

at p. 12). However, these three factors do not justify such a dramatic drop in efficiency savings because: (1) a large number of cost-effective efficiency opportunities remain despite the Federal Standards; (2) EM&V measure level savings estimates have little effect on the total amount of available cost-effective efficiency savings; and (3) many of the Company's programs remain highly cost-effective despite lower avoided costs.

Ameren's Efficiency Plan is based upon the analyses in the Company's Potential Study and IRP, both of which contain critical flaws that constrain efficiency resources. The Company's Potential Study significantly understates the amount of achievable efficiency savings by:

- applying customer adoption rates that do not reflect potential program participation under realistic or ideal implementation conditions;
- applying unrealistic and inappropriate program and portfolio cost estimates to determine program-level efficiency potential; and
- applying unreasonable and unrealistic artificial caps on and downward adjustments to the energy savings potential.

Ameren's 2014 IRP incorporates the results of the Potential Study and then further limits the efficiency savings by:

- excluding certain key efficiency programs, such as the Residential Home Energy Performance and Small Business Direct Install programs;
- dramatically understating the probable costs of complying with future federal greenhouse gas regulations, and not even considering the potential for energy efficiency to help offset those costs;

- modeling the two main efficiency scenarios (the realistically achievable potential (RAP), and the maximum achievable potential (MAP)) that do not represent a reasonable range of efficiency opportunities; and
- choosing the RAP portfolio for the Preferred Resource Plan, despite Ameren's finding that a resource plan that included the MAP portfolio would result in a significantly lower present value of revenue requirements (PVRR) than would a plan that included the RAP portfolio.

Ameren's Efficiency Plan, which is based upon these flawed analyses, suffers from the limitations described above. However, Ameren has many opportunities to address these shortcomings and expand its efficiency programs and savings by maintaining some programs that it plans to terminate; adding new programs that it analyzed but did not include in its Efficiency Plan; modifying existing program designs to increase customer adoption; and expanding program budgets to increase customer participation rates. Ameren should pursue these opportunities.

Q. What are the implications of Ameren proposing such low energy savings goals in its 2016-2018 Plan?

A. The implications are significant. Forgoing the opportunity to achieve additional, cost-effective energy efficiency savings will result in greater reliance on more expensive supply-side resources and lead to higher bills for customers on average.

The proposed Efficiency Plan is expected to reduce electricity costs, revenue requirements, and average customer bills by roughly $135 million in cumulative present value dollars. (Plan at p. 2). According to the results of the 2014 IRP, the Company could further reduce costs and bills by $215-$271 million in cumulative present value dollars

with greater energy savings. (IRP, Chapter 10 at p. 8). As I demonstrate below, higher levels of efficiency savings are achievable and would lower electricity costs even further.

In terms of capacity, the programs in the proposed 2016-2018 Plan are expected to reduce electricity demand by roughly 114 MW, for the measures installed in 2016-2018. (Plan at 15). According to the results of the Potential Study, the Company could save a total of 156 MW of peak demand with additional efficiency savings. If Ameren were to achieve the savings provided in the MEEIA guidelines,[5] then it could save roughly 240 MW of peak demand through 2018 and roughly 812 MW through 2025. This cumulative amount is roughly equivalent to one boiler at Ameren's Sioux coal-fired power plant and a small gas plant.

Q. Please summarize your primary recommendations.

A. First, I recommend that the Commission approve the Efficiency Plan only on the condition that Ameren modifies the Plan to achieve greater efficiency savings during the 2016-2018 period. Specifically, Ameren should increase the efficiency savings in its Plan to reach the MEEIA energy savings guidelines for 2016-2018. I make this recommendation because I am confident that the MEEIA savings levels can be achieved with cost-effective efficiency, based upon my review of the Company's Plan and the opportunities described herein for expanded efficiency savings.

[5] *See* 4 CSR 240-20.094 (providing that the commission shall use the greater of realistic achievable savings as determined through the utility's market potential study or savings goals provided in the regulation itself as a guideline to review progress toward an expectation that the electric utility's demand-side programs can achieve a goal of all cost-effective demand-side savings). My references to the MEEIA savings guidelines refer to the savings goals provided in this regulation.

Second, I recommend that the Commission direct Ameren to explore the use of all cost-effective energy efficiency resources as a means of mitigating the costs of complying with future federal greenhouse gas regulations.

Third, I recommend that the Commission direct Ameren to present and consider the results of the utility cost test in all future energy efficiency analyses, including potential studies, IRPs, and energy efficiency plans. These results should at least be considered when determining which efficiency programs are cost-effective.

Finally, I recommend against Ameren's request for a variance from the annual demand and energy savings target requirements in 4 CSR 240-20.094(1)(A), 20.094(3)(A) and 20.094(4)(A).

3. OVERVIEW OF AMEREN'S 2016-2018 ENERGY EFFICIENCY PLAN.

Q. Please summarize the process used by Ameren in preparing its 2016-2018 Plan.

A. The proposed Plan is the end product of many studies Ameren conducted, particularly the Potential Study and the 2014 IRP.

- The Potential Study developed several portfolios of efficiency savings, including a technical potential portfolio; a MAP portfolio (at the measure and program level); and a RAP portfolio (at the measure and program level).

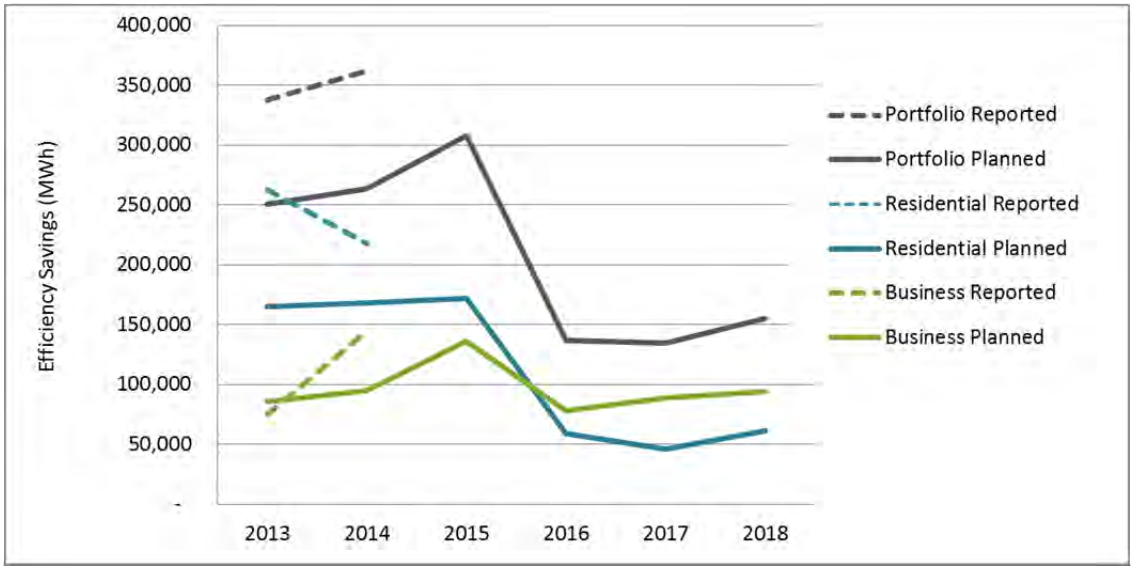
- The 2014 IRP analysis began with the program-level MAP and RAP portfolios from the Potential Study. Ameren made several updates and adjustments and then modeled the modified MAP and RAP portfolios alongside supply-side options to determine a Preferred Resource Plan.

- The 2016-2018 Plan derives from the IRP RAP portfolio, which served as the foundation for the proposed energy efficiency programs, budgets, and savings estimates in the Plan.

Q. How much energy is the Company's proposed Plan expected to save?

A. Figure 3.1 below presents the 2016-2018 planned energy savings for the residential sector, business sector, and total portfolio. For comparison purposes, the figure also shows the same information presented in the Company's 2013-2015 Energy Efficiency Plan and the actual savings that Ameren reported for 2013 and 2014. As indicated, the anticipated savings from the 2016-2018 Efficiency Plan are significantly lower than those from the previous plan, and residential savings make up a smaller portion of the total relative to the business savings.

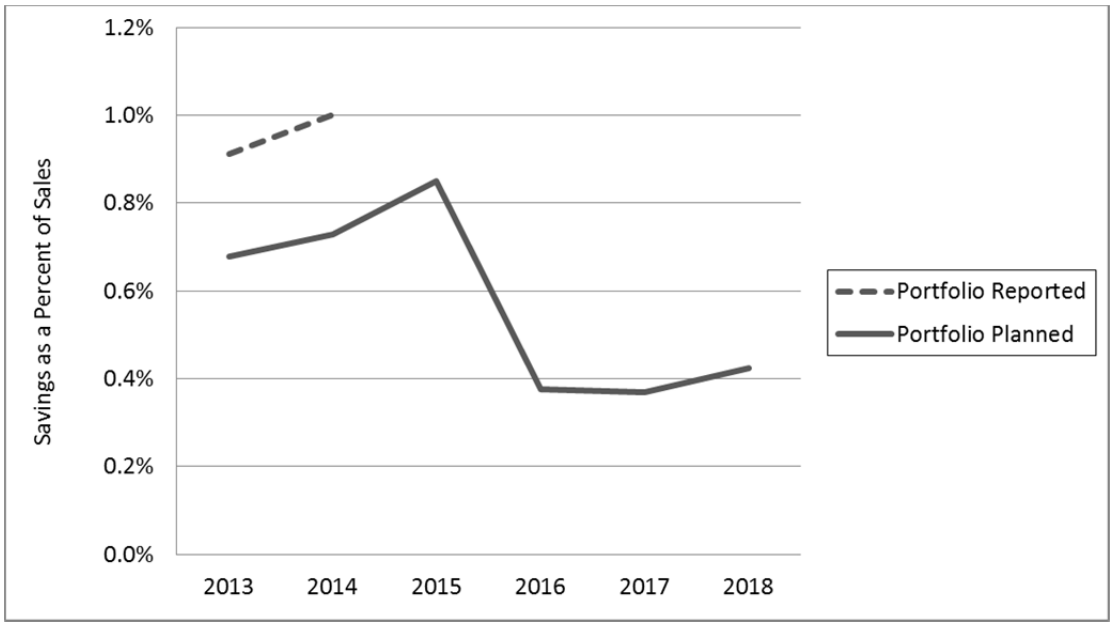
Figure 3.1 Energy Savings in Proposed Plan, 2013-2015 Plan, and Reported Savings



(Source: 2016-2018 Plan, Table 2.3 at p. 16; 2014 Annual Report).

Figure 3.2 presents the energy savings for the total portfolio, as a percent of total retail sales. In 2013 and 2014, Ameren achieved efficiency savings equal to roughly 1.0% of sales, but for 2016-2018, the Company plans to save roughly half of that amount.

Figure 3.2 Energy Savings, Planned and Reported, as a Percent of Retail Sales



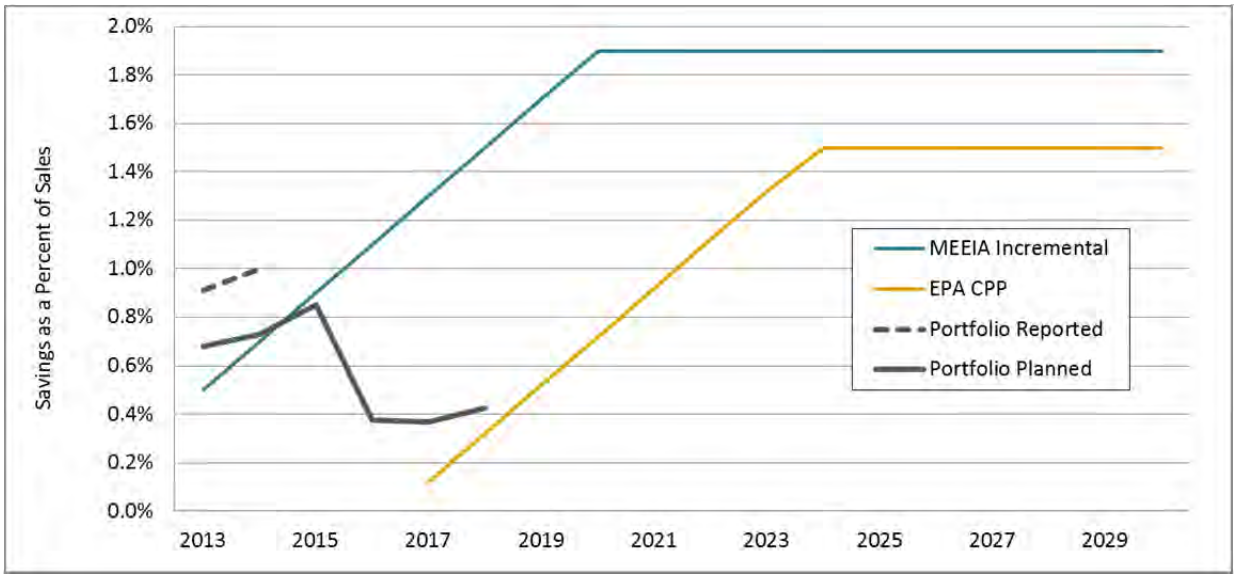
(Source: 2016-2018 Plan, Table 2.3 at p. 16; 2014 Annual Report; 2014 IRP Chapter 3 Appendix A at p. 82).

Q. How do the savings in Ameren's proposed Energy Efficiency Plan compare with the MEEIA guidelines?

A. Figure 3.3 presents the energy savings from the 2016-2018 Plan and the MEEIA savings guidelines. Whereas Ameren's planned savings in its 2013-2015 Plan and its 2013 and 2014 reported results met or exceeded the MEEIA guidelines, the 2016-2018 proposed savings levels are well below the MEEIA guidelines.

Figure 3.3 also presents the energy efficiency savings levels assumed in EPA's Clean Power Plan (CPP).[6] The Clean Power Plan anticipates that energy efficiency is one of the key building blocks that states can use to comply with greenhouse gas emission reduction requirements. The EPA estimated the amount of cost-effective efficiency savings that each state should be capable of achieving, based upon national experience and the historical experience of each state. The savings presented in Figure 3.3 are EPA's estimates for Missouri.

Figure 3.3 Energy Savings, Planned and Reported v. MEEIA Guidelines and CPP Targets, as a Percent of Retail Sales



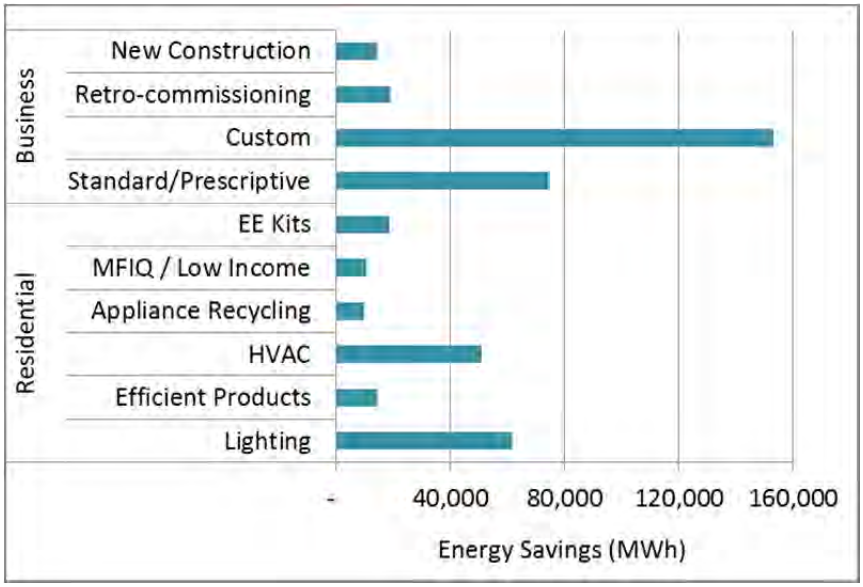
(Source: 2016-2018 Plan, Table 2.3 at p. 16; 2014 Annual Report; IRP Chapter 3, Appendix A at p. 82; 4 CSR 240-20.094; EPA 2014, CPP Data File: GHG Abatement Measures Appendix 5-4).

[6] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. 34,830 (June 18, 2014).

Q. Please provide a summary of the energy savings and budgets for each program.

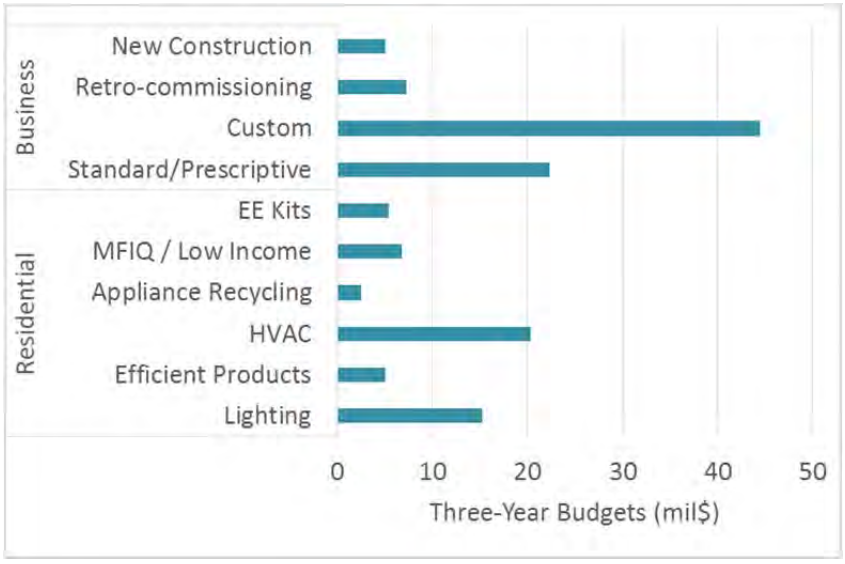
A. Figures 3.4 and 3.5 present a summary of projected energy savings and budgets, respectively, for each program, cumulative for 2016-2018.

Figure 3.4 Projected Energy Savings by Program, Cumulative for 2016-2018



(Source: 2016-2018 Plan at p. 22-23).

Figure 3.5 Projected Budgets by Program, Cumulative for 2016-2018

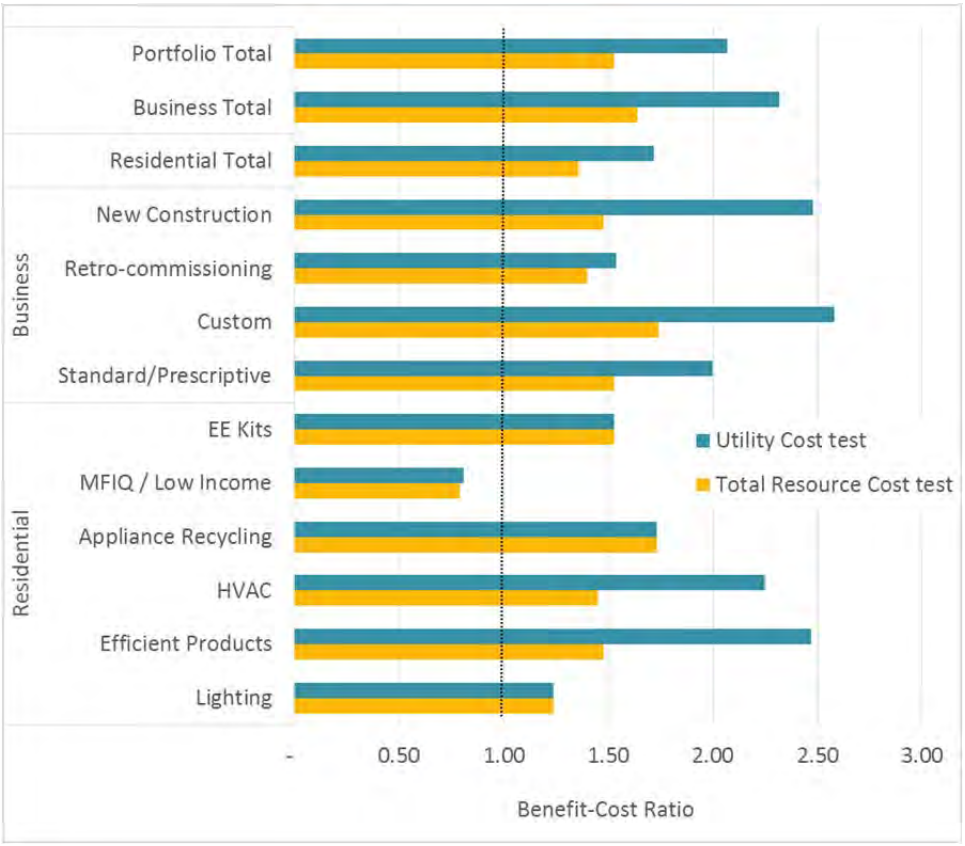


(Source: 2016-2018 Plan at p. 16).

Q. Are Ameren's proposed programs cost-effective?

A. Yes. Figure 3.6 presents the benefit-cost ratios for the total resource cost (TRC) test and the utility cost test (UCT) for each program, each sector, and the total portfolio. As indicated, each of the programs passes both the TRC and the UCT, except for the Low-Income program.

Figure 3.6 Benefit-Cost Ratios in the Energy Efficiency Plan



(Source: 2016-2018 Plan, Table 2.5 at p. 20).

4. AMEREN'S PLAN SIGNIFICANTLY UNDERSTATES COST-EFFECTIVE EFFICIENCY OPPORTUNITIES

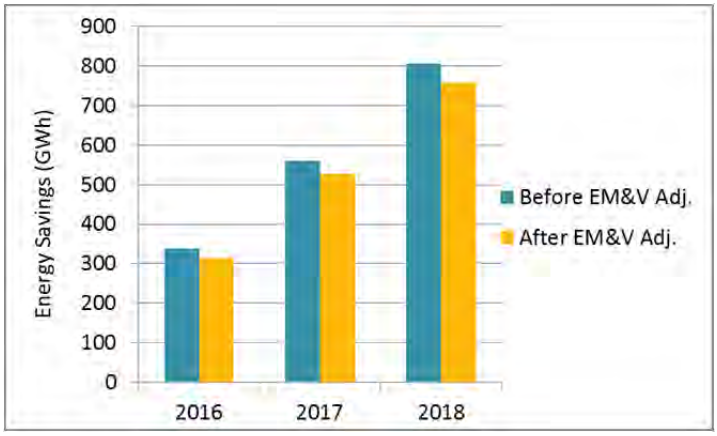
Q. How does the Company explain the significant reduction in energy savings in its proposed 2016-2018 Plan as compared to its 2013-2015 Plan?

A. Ameren provides three reasons for the difference between the two plans: (1) 2013 EM&V results indicated that measure savings were lower than anticipated in the Potential Study; (2) avoided costs are significantly lower than before; and (3) new Federal Standards reduce the potential for energy efficiency savings. (2016-2018 Plan at pp. 23-27).

Q. Do you agree that these reasons explain why Ameren's proposed savings for 2016-2018 are so much lower than the 2013-2015 savings?

A. No. I disagree with all three of the reasons Ameren provided. First, the 2013 EM&V results caused a very small adjustment to the savings estimated in the Potential Study. Figure 4.1 presents the estimated efficiency savings from the Potential Study (for RAP measure-level savings) and the estimated efficiency savings in the IRP after adjusting for the results of the 2013 EM&V studies. As indicated, the reduction in energy savings is relatively small and is not a major contributor to Ameren's dramatic reduction in planned efficiency savings.

Figure 4.1 Reduced Energy Savings in the IRP as a Result of 2013 EM&V Results



(Sources: 2014 IRP, Chapter 8, Tbls. 8.2 and 8.3 at pp. 9, 11).

Second, the efficiency measures and programs in the 2016-2018 Plan are all cost-effective, despite the reduction in avoided costs. While it may be true that the proposed efficiency programs are *less* cost-effective than those in the 2013-2015 Plan, this does not mean that they are *not* cost-effective. In addition, the Potential Study found that only six percent of the measures that were cost-effective in the 2013-2015 Plan were not cost-effective in the 2016-2018 Plan as a result of the reduced avoided costs. (NRDC's Comments on Ameren's 2014 IRP at p. 9). Therefore, reduced avoided costs are also not a large contributor to the disparity in efficiency savings between the two plans.

Third, recent Federal Standards do not explain the significant drop in proposed efficiency savings. Many cost-effective efficiency opportunities remain, even in the lighting sector, despite the Federal Standards.[7] In fact, Ameren achieved relatively high savings --

[7] *See generally*, *Northeast Regional Lighting Strategy: 2013-2014 Update*, Northeast Energy Efficiency Partnerships (October 2013). Attached as Schedule TW-2.

higher than the savings included in the 2013-2015 Plan – in 2014, when many of the new Federal Standards were in effect, as indicated in Figure 3.1. Additionally, the Potential Study accounts for Federal Standards in its estimates of the technical and economic potential levels.

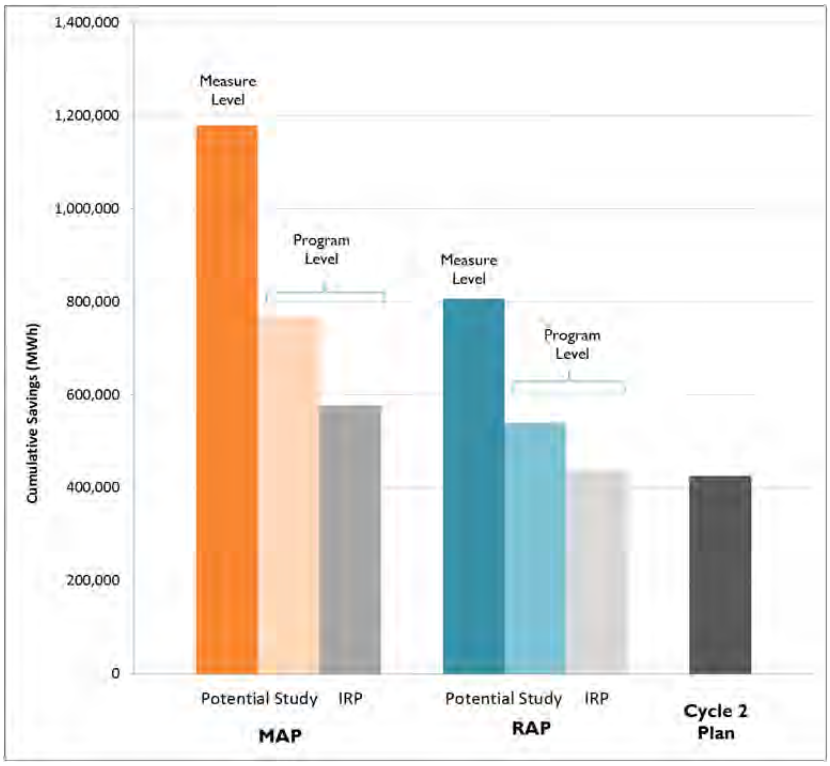
Q. What then accounts for the low efficiency savings in the 2016-2018 Plan?

A. There are many reasons why the efficiency savings proposed in the 2016-2018 Plan are so low. In each of its efficiency analyses, especially the Potential Study and the 2014 IRP, Ameren makes several assumptions, modifications and adjustments that chip away at the efficiency potential until the remaining savings that are deemed to be realistic and cost-effective are a small fraction of the original estimates.

This effect is illustrated generally in Figure 4.2 below, which presents several key efficiency savings estimates in the Potential Study, 2014 IRP, and 2016-2018 Plan. The figure indicates the following:

- There is a significant reduction in estimated efficiency savings between the measure-level estimates and the program-level estimates in the Potential Study. I address this issue further in Section 5 of my testimony.
- There is a significant reduction in efficiency savings between the MAP and RAP portfolios in both the Potential Study and the 2014 IRP. I address this issue in Sections 5 and 6 of my testimony.
- There is a significant reduction in estimated efficiency savings between the Potential Study and the Plan and the 2014 IRP. I address this issue in Section 6 of my testimony.

Figure 4.2 Program Level v. Measure Level Savings (2016-2018)



(Source: Potential Study, Vol. 3 at pp. 5-4, 5-8, 5-13, 6-9, 6-10; 2014 IRP, Chapter 8 at p. 22, [extracted from Figure 8-7]).

Q. Are there actions that Ameren can take to increase the efficiency savings in its Plan?

A. Yes. There are many things that Ameren can and should do to increase the amount of efficiency savings in its 2016-2018 Plan. For example, Ameren can:

- Maintain some programs that are proposed to be terminated; for example, the Residential New Construction and HEP programs.
- Add programs that have not been implemented and are not yet a part of the proposed Efficiency Plan; for example, a Small Business Direct Install, and a Street Lighting program.

- Modify existing program designs to increase customer adoption; for example, through increased use of upstream buydown practices for lighting products, HVAC measures, and certain efficient appliances.

- Expand program budgets to increase participation rates for programs serving key customer segments.

Q. What would be the outcome of Ameren undertaking these actions to increase the efficiency savings from the 2016-2018 Plan?

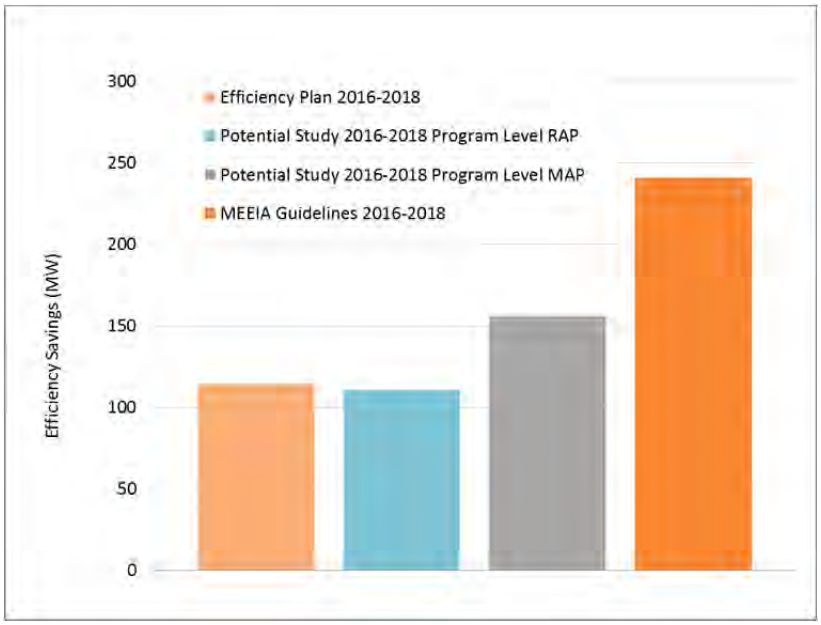
A. These actions could dramatically increase the efficiency savings over the next three years for residential, low-income, and business customers. I believe that sufficient management attention and resources dedicated to achieving all cost-effective energy efficiency could result in efficiency savings levels that meet the MEEIA guidelines for the years 2016-2018.

Q. How much of an impact will the efficiency programs have on the need for new power plants?

A. Figure 4.3 presents the amount of peak demand that could be avoided under different efficiency scenarios. The programs in Ameren's Energy Efficiency Plan are expected to save 114 MW of customer peak demand over the three-year period 2016-2018. If the Company were to implement efficiency programs consistent with the MAP portfolio in the Potential Study it could save roughly 156 MW of peak demand, and if it were to achieve the capacity savings in the MEEIA regulation guidelines then it could save roughly 240 MW of peak demand during this period and roughly 812 MW by 2025. This

is very roughly equivalent to one boiler at Ameren's Sioux coal-fired power plant and a small gas plant.[8]

Figure 4.3 Demand Savings from the Potential Study, the Efficiency Plan and MEEIA Guidelines



(Source: Potential Study, Vol. 3, p. 6-10; 2016-2018 Plan, p. 6; 4 CSR 240-20.094(2)(A); 2014 IRP, Chapter 3, Appendix A at p. 83).

5. AMEREN'S 2013 DSM MARKET POTENTIAL STUDY

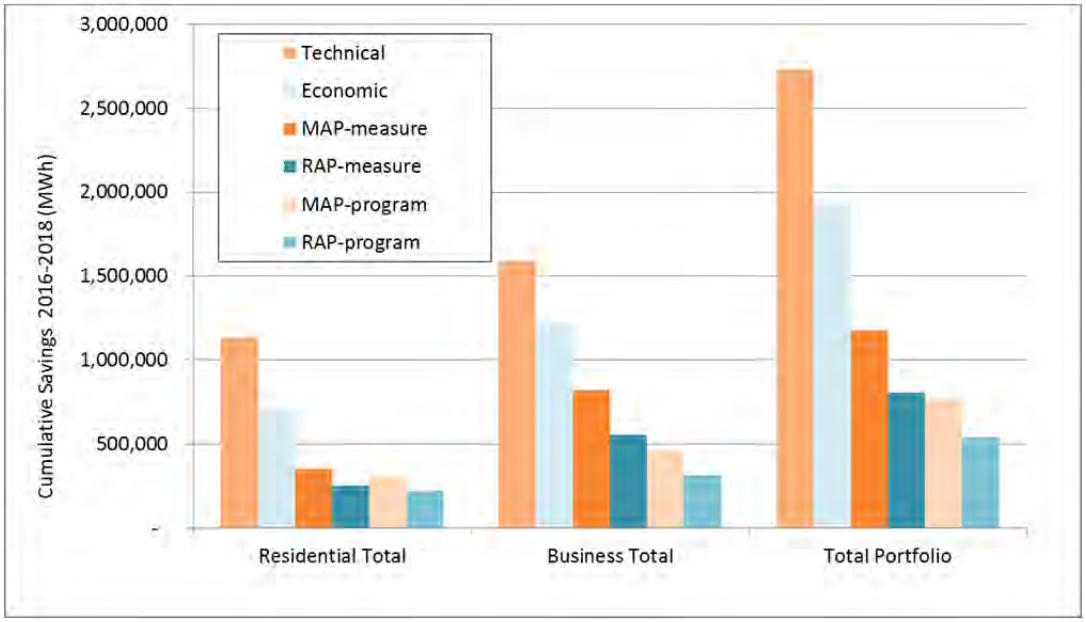
Q. Please provide a summary of the findings of the Potential Study

A. Figure 5.1 provides a summary of some of the key findings of the Potential Study. It shows the study's estimate of potential energy savings (by sector and by portfolio. The

[8] Note that the amount of generation capacity that can be avoided by energy efficiency is higher than the amount of reduced peak demand (by roughly 15 to 20 percent), because of the reserve margin used for generation planning. Consequently, to indicate the amount of generation capacity avoided by the 2016-2018 Plan, all of the numbers presented here should be increased by Ameren's planning reserve margin.

potential energy savings are presented in terms of technical, economic, RAP, and MAP portfolio levels.

Figure 5.1 Potential Study: Savings Under Different Portfolios, Cumulative (2016-2018)



(Source: Potential Study, Vol. 3 at pp. 5-4, 5-8, 5-13, 6-9 and 6-10).

As indicated, and as is typically the case with potential studies, there is a significant difference between the technical potential and the economic potential. Note that the economic potential for all of the scenarios is based on results of the TRC test. Also, there is a dramatic reduction in savings from the economic potential to the MAP and RAP portfolios.

Q. Please summarize your view of the Potential Study, particularly as the study affects the 2016-2018 Plan.

A. I have three main concerns with the study's assumptions and methodologies. First, the economic potential results are somewhat limited. Second, the methodology used to define and determine the MAP and RAP portfolios significantly understate the "maximum" and "realistic" achievable potentials. Third, the assumptions used to determine program-level savings are overly conservative and dramatically reduce the level of achievable program savings.

Q. Please explain why the economic potential results are limited.

A. The Potential Study used the results of the TRC test to define the economic potential and also the MAP and RAP portfolios. This methodology excludes measures and programs that pass the UCT but not the TRC test, which understates the efficiency opportunities from the economic portfolio and from all the MAP and RAP portfolios. (I discuss the cost effectiveness tests in more detail in Section 7).

In addition, in calculating the TRC benefits, the study authors do not include the benefits associated with fossil fuel savings or other resource savings such as water. These benefits can be significant and can make a material difference in the results of the TRC test. The costs required to achieve the fossil fuel and other resource savings are included in the TRC costs, so excluding the benefits of these savings results in a test that is skewed against energy efficiency by design. Consequently, defining the economic potential using these assumptions reduces the estimates of the economic potential. This is particularly true for certain programs that result in fossil fuel or other resource savings, such as a

Residential New Construction program or a Residential Home Energy Performance program. In these cases, the Company and the Commission should give considerable weight to the results of the UCT, for the reasons stated above and because it is not inherently skewed.

Q. Generally, how should estimates of achievable potential be viewed?

A. Estimating the amount of efficiency savings that is "achievable" is one of the more challenging aspects of any efficiency potential study. This is partly because the amount of efficiency savings that is achievable depends upon many factors (for example, customer incentives, customer education, technical assistance provided, program designs, marketing and delivery) that are difficult to model systematically. Many of these factors are not even developed yet at the time of the potential study, and therefore cannot be factored in to the achievable potential results. In addition, many of those factors are within the control of the utility implementing the efficiency programs.

Thus, the amount of achievable potential is actually a very dynamic value, which can be modified considerably depending upon a utility's energy efficiency initiatives. The ability of a utility to influence the amount of achievable potential is rarely (if ever) captured in efficiency potential studies.

As a result, estimates of achievable efficiency potential should be viewed as rough guidelines as to what might be achievable. Unfortunately, the results of efficiency potential studies are often construed as fixed upper limits of what is achievable, which typically understates what is really achievable.

Q. How do Ameren's MAP and RAP portfolios understate achievable efficiency savings?

A. The Potential Study's assumptions about participation rates are the primary reason why the MAP and RAP portfolios understate achievable efficiency savings. That study uses market adoption rates for each measure to estimate the extent to which customers are likely to adopt each measure. The adoption rates are based on Ameren customer surveys that were conducted by the study authors. For the RAP portfolio, the study authors assumed that customers would be offered financial incentives that reduced the payback of the efficiency measure to three years. For the MAP portfolio, the authors assumed that customers would be offered incentives resulting in one-year payback periods. (Potential Study, Vol. 3 at p. 2-12).

There are several limitations to this methodology. First, this approach does not account for the many factors beyond customer incentives that might cause customers to participate, including customer education, technical assistance, program design, marketing and delivery features.

- For example, many utilities deliver efficiency measures through upstream buydown programs, where a financial incentive is offered to manufacturers and distributors of efficiency products before they arrive at retail stores. These types of programs have proven to dramatically increase customer participation, yet they are not accounted for when estimating measure adoption rates, significantly understating the RAP and the MAP potential.

- Another example is customer behavioral programs, in which customers are not offered any incentive but are provided with information about consumption patterns and opportunities to reduce consumption. These behavior programs can result in a significant program participation, sometimes greater participation than all other programs, without offering any financial incentive at all. Again, this type of program design is not considered in developing market adoption rates.

- Yet another example is statewide marketing and outreach programs that can significantly increase customer awareness and adoption of efficiency measures, or statewide programs to train contractors, technicians and other trade allies to promote, deliver, install and maintain efficiency equipment.

The second limitation to this methodology is that Ameren could, and in some cases should, offer financial incentives equal to payback periods shorter than three years, but these are not included in the "realistic" portfolio. Ameren's three-year assumption could potentially eliminate a large portion of efficiency measures and savings from the RAP portfolio, even though incentives leading to payback periods of less than three years are realistic, reasonable and appropriate in many instances.

Finally, there are many ways that customers might adopt additional measures beyond those identified in the RAP and MAP portfolios, once the measures are offered as bundled programs. It is common for customers participating in a program to adopt several measures once they learn of all the opportunities available, and it is also common for customers to participate in additional efficiency programs as a result of being referred to them by other programs. This type of interactive effect between measures is not captured in the market adoption rates, again understating the amount of achievable potential.

Q. Do you have other concerns about customer participation assumptions in the Potential Study's MAP and RAP portfolios?

A. Yes. Ameren applied two downward adjustments on the market adoption rates for each measure in the Potential Study. First, it applied "take rate" downward adjustment factors to the potential efficiency savings, ranging from 56 to 62 percent for residential customers, and 72 to 83 percent for business customers. (Potential Study, Vol. 2, pp. 3-2 to 3-3 and tbls. 3-1, 3-2, 7-1 and 7-2). This eliminates a significant portion of savings from what is considered realistic.

Second, Ameren applied an additional downward adjustment based on responses to psychographic segmentation questions. Under these adjustments, a survey respondent would have to indicate that he or she is very satisfied with service from Ameren (with a score of "10" on a scale of 1-10), and that he or she believes that the threat from climate change is real and significant (agree or disagree). (Potential Study, Vol. 2, pp. 3-4 to 3-5).

These downward adjustments are completely unreasonable and are not an indication of whether a customer is likely to adopt any particular efficiency measure. Many customers adopt efficiency measures even if they do not have an excellent (10 out of 10) opinion of their electric utility, and many customers adopt efficiency measures for reasons other than environmental and climate change benefits. For example, many customers adopt efficiency measures because they will save money on their electric bills. These adjustments, in and of themselves, indicate that the Company's MAP and RAP portfolios are inconsistent with what customers actually do in practice, and do not indicate the full amount of achievable efficiency savings.

Q. How does Ameren use and describe the results of its RAP portfolio?

A. Ameren misstates what its RAP portfolio actually represents. A RAP portfolio should represent what can be achieved from "expected program participation and realistic implementation conditions." (4 CSR 240-22.020(49)). Ameren describes its RAP portfolio as representing "all cost-effective energy efficiency" (Plan at p. 17). However, Ameren's RAP portfolio represents neither.

Ameren's RAP portfolio dramatically understates the amount of efficiency savings available, primarily as a result of its methodology and assumptions regarding customer adoption rates, and does not represent what is realistically achievable.

With respect to Ameren's claim that its RAP portfolio represents all cost-effective efficiency, the Potential Study states that RAP reflects "expected program participation given barriers to customer acceptance, non-ideal implementation conditions, and limited program budgets. This represents a lower bound on achievable potential." (Potential Study at p. 1-4). This suggests that the RAP portfolio from the Potential Study does not represent all cost-effective demand-side savings, as the Company asserts.

In addition, a RAP portfolio, even one that presumably meets the theoretical definition of realistically achievable, is not necessarily equivalent to all cost-effective demand-side savings. The MEEIA regulations state that:

> The commission shall use *the greater of* the annual realistic achievable energy savings and demand savings as determined through the utility's market potential study or the following incremental annual demand-side savings goals as a guideline to review progress toward an expectation that the electric utility's demand-side programs can achieve a goal of all cost-effective demand-side savings...

(4 CSR 240-20.094(2)(A)) (emphasis added).

In my view, the fact that the regulations require the Commission to use *the greater of* realistic achievable energy savings and the annual savings goals suggests that a RAP portfolio is not necessarily equal to all cost-effective efficiency savings, and that higher levels of savings might be deemed to be cost-effective.

Q. How does Ameren use and describe the results of its MAP portfolio?

A. Similarly, Ameren describes its MAP portfolio as "the upper limit" of energy efficiency potential. (2014 IRP, Chapter 8 at p. 54). However, this is a misleading representation of its MAP portfolio. A MAP portfolio should represent an upper limit on the amount of energy efficiency that can be achieved based on "expected program participation and ideal implementation conditions" (4 CSR 240-22.020(40)). Ameren's "MAP" portfolio does not represent the maximum amount that is achievable, again because it understates what program participation rates could be and it does not apply idealistic implementation conditions.

Q. Turning to your third concern with the Potential Study, please explain why the assumptions Ameren used to determine program-level savings are overly conservative and dramatically reduce the level of achievable program savings.

A. The Potential Study eliminates a large amount of cost-effective efficiency savings as a result of its assumptions regarding program-level savings. This is illustrated in Figure 4.2 above, which shows the difference in efficiency potential between the measure-level savings and the program-level savings.

The Potential Study notes that "the most significant difference between the measure-level potential and the program potential is the assignment of program costs." The study adds

base program costs and portfolio administration costs to the measure costs. (Potential Study at p. 6-2). The Potential Study also notes that these additional costs caused several measures to be uneconomic, and they were therefore removed from the programs.

Q. Do you agree with these assumptions and methodologies used to create program-level savings estimates?

A. No. I have not been able to assess the magnitude of the base program costs and the portfolio administration costs, as these were not presented in the Potential Study. However, it appears that these costs are very large, given the impact that their addition had on the efficiency savings estimates. I question whether those assumptions are reasonable, especially given that a lot of program costs and portfolio administration costs are fixed, and will not vary significantly by the addition of certain efficiency measures.

In addition, the methodology used to screen efficiency measures, by adding indirect costs and screening measure-by-measure, is not best practice. This measure-level screening approach has been rejected by many states. Most of the costs of efficiency programs are a result of getting customers to participate in a program, and providing them with an audit of their home or business. Once a customer has gotten to this point, the program and portfolio costs have already been incurred. They are not only fixed costs, they are also sunk costs. Thus, once a customer participates, the most economic and appropriate action is to install all of the measures that are cost-effective based on the measure costs alone. Otherwise, there will be a significant amount of lost opportunities, where cost-effective measures are not adopted and are very unlikely to be adopted at a later time. Many states do not screen efficiency programs on a measure basis at all, and just screen on a program basis, with reasonable estimates of program costs included, to avoid this effect.

6. AMEREN'S 2014 INTEGRATED RESOURCE PLAN

Overview of the IRP

Q. Turning to Ameren's 2014 IRP, please summarize how Ameren modeled efficiency programs in the IRP.

A. Ameren used the measure-level MAP and RAP portfolios from its Potential Study to develop similar MAP and RAP portfolios in its 2014 IRP. Ameren made several adjustments to the Potential Study results in developing inputs for the 2014 IRP. One of the key adjustments was to update the measure savings to reflect the data from the 2013 EM&V studies. (2014 IRP, Chapter 8 at pp. 9, 11). Another adjustment was to consider and remove, if not cost-effective, programs that were proposed in the 2014 IRP (2014 IRP, Chapter 8 at p. 12).

These inputs and assumptions resulted in two energy efficiency scenarios: a MAP portfolio and a RAP portfolio.[9] Ameren developed a set of alternative resource plans that included variations of either the MAP or RAP portfolios (2014 IRP, Chapter 10, pp. 6-7).

Finally, Ameren selected the RAP portfolio for its Preferred Resource Plan. The 2014 IRP notes that both the MAP and RAP portfolios result in reduced total cost to customers. In fact, the MAP portfolio resulted in the lowest PVRR, but the Company decided to include the RAP portfolio in its Preferred Resource Plan. (2014 IRP, Chapter 10 at p. 8, tbl. 10.3) The Company justifies choosing the RAP portfolio on the basis of risk and

[9] The 2014 IRP also included a third efficiency scenario (MID) that assumed costs and savings half-way between these two cases.

reward considerations from the perspective of both customers and Ameren (2014 IRP, Chapter 10 at pp. 11-12).

Q. Please provide a summary of the results of the 2014 IRP as they apply to the development of the 2016-2018 Efficiency Plan.

A. Figure 4.2 above presents a summary of some of the key results of the efficiency portfolios in the 2014 IRP. It shows that the IRP MAP and RAP portfolio savings are less than the savings from comparable portfolios from the Potential Study, and the IRP RAP portfolio savings are close to the savings in the 2016-2018 Plan.

Table 6.1 presents a summary of the cost-effectiveness analysis of both the MAP and the RAP portfolios, for both the UCT and the TRC tests. (The table includes the RAP results for programs implemented over 2016-2018 only, and for programs implemented over 2016-2034, the entire study period.). As indicated, all of the programs are cost-effective under both tests, except for the Residential Low-Income program.

Table 6.1 Benefit-Cost Ratios for the MAP and RAP Portfolios in the 2014 IRP

		IRP 2016-2018 RAP		IRP 2016-2034 RAP		IRP 2016-2034 MAP	
		TRC	UCT	TRC	UCT	TRC	UCT
Residential	Lighting	1.05	1.06	0.96	0.96	0.96	0.96
	Efficient Products	1.29	1.98	1.71	3.17	1.44	2.07
	HVAC	1.34	1.99	1.72	2.70	1.29	1.73
	Appliance Recycling	1.08	1.08	1.27	1.27	1.02	1.02
	MFIQ / Low Income	0.79	0.81	1.00	1.01	0.93	0.95
	EE Kits	1.53	1.53	1.57	1.57	1.10	1.11
Business	Standard/Prescriptive	1.49	1.93	2.75	3.32	2.32	2.20
	Custom	1.67	2.43	2.13	2.84	1.83	1.90
	Retro-commissioning	1.59	1.59	2.36	3.21	1.97	2.02
	New Construction	1.46	2.40	2.42	3.82	2.10	2.47
	Residential Total	1.22	1.50	1.54	2.19	1.27	1.63
	Business Total	1.61	2.22	2.37	3.11	2.02	2.05
	Portfolio Total	**1.45**	**1.91**	**2.01**	**2.72**	**1.69**	**1.89**

(Source: 2014 IRP, Chapter 8 at tbls. 8-7, 8-9, and 8-10).

Q. Please summarize your findings on the 2014 IRP, particularly as it applies to the development of the 2016-2018 Plan.

A. The 2014 IRP significantly understates the amount of cost-effective efficiency savings that are achievable on the Ameren system. In sum, the IRP:

- focuses on the MAP and RAP scenarios from the Potential Study, which understate cost-effective efficiency potential;
- chooses the RAP portfolio for its Preferred Resource Plan, despite the fact that the MAP portfolio is expected to reduce costs by more than the RAP portfolio;
- improperly accounts for probable environmental costs, particularly the cost of complying with the EPA's Clean Power Plan; and

- reduces the amount of savings indicated by the MAP and RAP portfolios by excluding several key efficiency programs.

I address each of these points below.

Analysis of MAP and RAP Portfolios

Q. Why does focusing on the MAP and RAP scenarios understate the amount of cost-effective efficiency savings?

A. As discussed in Section 5, the MAP and RAP scenarios in the Potential Study do not account for all of the potentially achievable cost-effective efficiency savings. The MAP and RAP portfolios in the IRP are based directly on those from the Potential Study, with the exception of the few updates and modification listed above. Therefore, all of the limitations of the RAP and MAP studies described in Section 5 apply to the 2014 IRP as well.

Furthermore, IRPs should not define energy efficiency so narrowly, with only two possible future efficiency portfolios. One of the key purposes of any IRP is to assess a variety of different levels of energy efficiency programs, in order to determine which level is most cost-effective and meets the selection criteria of the IRP. By limiting the IRP analysis to the narrowly-defined MAP and RAP scenarios from the Potential Study, the Company has not fully identified or investigated the amount of cost-effective energy efficiency savings that are available on its system.

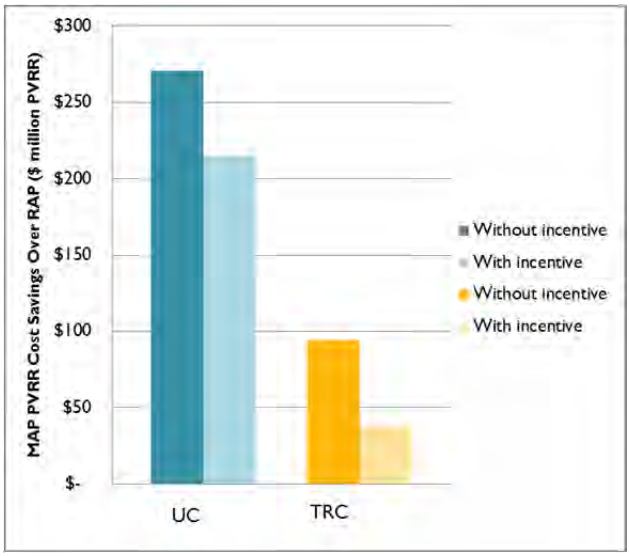
In particular, the Company should at least investigate a portfolio of efficiency programs that is consistent with the energy efficiency building block assumptions used by the EPA

in the proposed CPP and a portfolio of efficiency programs that is consistent with the energy savings guidelines in the MEEIA regulations. Even if the Company does not eventually include such portfolios in its Preferred Resource Plan, it would be very informative to at least study the potential costs and benefits of them.

Q. Do you have any concerns about how the Company chose the RAP portfolio for its Preferred Resource Plan?

A. Yes. The MAP portfolio would reduce electricity costs and average bills by significantly more than the RAP portfolio. Figure 6.1 presents a summary of the estimated reductions in PVRR from the RAP portfolio relative the MAP portfolio.

Figure 6.1 Reductions in PVRR from MAP v. RAP Portfolios in the 2014 IRP



(Source: 2014 IRP, Chapter 10 at p. 8).

The Company justifies its choice of the RAP portfolio by referring to its analysis of the year-by-year cost differences between the two portfolios, and its understanding of the

increased level of risk in achieving MAP relative to RAP (2014 IRP, Chapter 10 at pp. 11-12).

Q. Do you agree with the Company's rationale for choosing the RAP portfolio for its Preferred Resource Plan?

A. No. First, I do not agree with the Company's conclusion regarding the year-by-year cost differences between the two portfolios. Ameren assumes a significant increase in the cost of saved energy for the MAP portfolio relative to the RAP portfolio, where the MAP portfolio budget is roughly twice that of the RAP portfolio budget but the MAP savings are only 35 percent greater than the RAP savings. (IRP, Chapter 10 at p. 9). This increase in the cost of saved energy is in direct contrast to the experience of many energy efficiency program administrators, who find that increased efficiency savings levels can be achieved for similar, or even reduced, cost of saved energy. This unreasonable assumption puts the MAP portfolio at a significant undue economic disadvantage relative to the RAP portfolio, and undercuts the Company's year-by-year cost analysis.

Second, I do not agree with the Company's conclusion regarding the risk associated with achieving MAP relative to RAP. Ameren disadvantages the MAP portfolio by applying a negative risk scalar of 18 percent, whereas the RAP portfolio has a symmetrical risk scalar of plus or minus only 8 percent. (2014 IRP, Chapter 8 at pp. 86-87). This scalar is too high for the MAP scenario, and should be symmetrical. In addition, the IRP does not take into account the ways that increased energy efficiency savings can help reduce risk. Nonetheless, despite this unreasonable scalar for higher risk, the MAP portfolio resulted in lower PVRR relative to the RAP portfolio. Apparently, the Company applied some *additional* quantitative risk considerations for rejecting the MAP portfolio. In my view,

the Company's arguments do not justify its decision to reject an energy efficiency portfolio that will clearly lead to reduced costs and reduced average customer bills as compared to the RAP portfolio.

Accounting for Environmental Compliance Costs

Q. Please describe how Ameren accounted for the cost of complying with federal CO2 regulations in the 2014 IRP.

A. Ameren applied a forecast of CO2 allowance costs to represent the costs of complying with the CPP. It developed a forecast based upon a study prepared by my colleagues at Synapse Energy Economics.[10] Ameren used this report to make its own forecast, where the CO2 allowance prices are assumed to be zero through 2024, and are then equal to the Synapse forecast thereafter.

Moreover, Ameren did not assume that these prices will exist in all of its planning scenarios. It assumed that only five out of fifteen future scenarios will include any future cost of complying with federal CO2 regulations through 2035. Ameren then assigned probability weightings to each of its future scenarios, which result in a probability of only 15 percent that any one of the scenarios with CO2 costs will occur.

[10] Patrick Luckow et al., 2013 Carbon Dioxide Price Forecast, Synapse Energy Economics, (November 1, 2013, minor corrections made on February 2014), available at http://www.synapse-energy.com/sites/default/files/SynapseReport.2013-11.0.2013-Carbon-Forecast.13-098.pdf.

Q. Do you agree with Ameren's methodology for modeling the cost of compliance with the CPP?

A. No. Ameren's assumptions about the timing and magnitude of costs of complying with the CPP (or any federal CO2 requirements) are unreasonable, untenable, and inconsistent with other statements and assumptions in the 2014 IRP. While there is some uncertainty regarding the implementation if the CPP, Ameren's assumptions about the probability of CPP are clearly too low.

A recent update to the Synapse CO2 price forecast, which accounts for the implications of EPA's proposed CPP regulations, provides a much more reasonable range of future CO2 prices. The study concludes that federal action to address climate change is "extremely likely," and that costs to comply with federal action will be required by 2020.[11]

Q. Is Ameren's modeling approach consistent with related statements in the 2014 IRP?

No. Immediately after describing the CO2 price forecast used in the 2014 IRP, the Company stated that "the actual cost of complying with greenhouse gas regulations can be higher depending upon the specifics of the regulation. As discussed later, we do in fact expect [*sic*] costs to comply with EPA's proposed Clean Power Plan to be higher than $53/ton." (2014 IRP, Chapter 1 at p. 11).

[11] Patrick Luckow et al., 2015 Carbon Dioxide Price Forecast, Synapse Energy Economics (March 3, 2015), available at http://www.synapse-energy.com/sites/default/files/2015%20Carbon%20Dioxide%20Price%20Report.pdf.

The Company does not explain why its modeling assumptions differ so dramatically from its position that compliance costs are likely to be higher than the costs assumed in the High CO2 case, or why even this high case is assumed to have a probability of occurrence of only three percent.

Q. What are the implications of Ameren's decision to model the cost of complying with federal greenhouse gas regulations this way?

A. The implications are dramatic. A large portion of the Company's generation fleet is made up of older coal plants, which tend to have high GHG emission rates. Costs of complying with federal greenhouse gas regulations, combined with the costs of complying with other EPA emission regulations, will increase the costs of those plants, improve the economics of retiring those plants, and improve the economics of all the electricity resources that emit little, or no, CO2.

Q. More specifically, what are the implications of this decision with regard to the evaluation of energy efficiency resources in the 2014 IRP and the proposed Efficiency Plan?

A. Energy efficiency resources are widely regarded as the lowest-cost means of complying with the proposed CPP. Yet, the 2014 IRP does not even analyze or investigate the potential to mitigate the costs of complying with federal greenhouse gas regulations using increased energy efficiency savings.

First, by assuming very low probabilities that there will be any federal greenhouse gas emission requirements, and by assuming relatively low estimates for CO2 allowance prices, the Company significantly understates the additional costs that could be avoided

by efficiency programs. Second, and very importantly, by modeling only two future efficiency scenarios (the MAP and RAP portfolios), the Company does not investigate the opportunity for *increased* levels of efficiency to be used to mitigate greenhouse gas compliance costs.

Q. Does the Company seriously consider energy efficiency as an option for complying with the CPP?

A. Apparently not. In the 2014 IRP, Ameren makes it clear that it does not intend to use energy efficiency resources to mitigate the cost of complying with the CPP. The Company presents a description of how it might modify its Preferred Resource Plan if the EPA CPP regulations were to be implemented. It lists four changes that it would make: (1) advancing the retirement of Meramec by three years; (2) constructing a 1,200MW combined cycle power plant by 2020; (3) altering the dispatch of new and existing coal and gas resources so that gas would run more frequently; and (4) constructing additional wind (or possibly nuclear) resources in the 2022-2030 timeframe (2014 IRP, Chapter 1 at p. 17). There is no mention of using efficiency to respond to the CPP regulations.

This is a remarkable omission. It is especially remarkable given that the Company is concerned about the high cost of complying with the CPP regulations, with an estimate of compliance costs as high as $4 billion over fifteen years starting in 2020 (2014 IRP, Chapter 1 at p. 17).

It is also remarkable given that the EPA has estimated that energy efficiency offers the greatest opportunity for Missouri to comply with the proposed CPP regulations. Specifically, EPA estimates that energy efficiency could account for 38 percent of needed

emission reductions, while 27 percent could come from lower average coal emission rates, 25 percent could come from redispatch of natural gas units, 7 percent from incremental renewable resources, and 3 percent from at-risk nuclear plants (Synapse estimates based on Clean Power Plan Proposed Rule Data File: GHG Abatement Measures Appendix 5-4).[12]

Exclusion of Efficiency Programs

Q. Did the 2014 IRP include all of the efficiency programs that were included in the Potential Study?

A. No. Ameren excluded several programs from the IRP MAP and RAP scenarios that were included in the Potential Study, including: Residential New Construction, Residential Home Energy Performance, Residential Electronics, Residential Multi-Family, Small Business Direct Install, and Multi-family Common Area.

The Potential Study made the following findings with regard to these programs:[13]

- The Residential New Construction program could be cost-effective, and could save as much as 9,421 MWh.
- The Home Energy Performance (HEP) program could be cost-effective, and could save as much as 27,473 MWh. (Note that Ameren has replaced the HEP program with the Energy Efficiency Kits program, which is expected to save 18,636 MWh.

[12] The workbook used to make this calculation is available at http://www.synapse-energy.com/tools/111d-cost-estimate-tool-states. (Refer to "State Data" tab).

[13] The energy savings presented below are all cumulative for three years 2016-2018, from the RAP portfolio. The energy savings are provided in Table 6-3, and the benefit-cost results are provided in Table 6-5 of Volume 3 of the Potential Study.

Therefore the net effect of switching from the HEP program to the Energy Efficiency Kits program is a reduction in savings of 8,837 MWh.)

- The Residential Electronics program could be marginally cost-effective, and could save as much as 16,777 MWh.
- The Small Business Direct Install could be cost-effective, and could save as much as 30,536 MWh.
- The Multi-Family Direct Install and the Multi-Family Common Area programs could be cost-effective, and could save as much as 9,384 MWh combined.

The potential savings from these programs combined could be as high as 74,995 MWh, which would represent a roughly 18-percent increase in the total energy savings of the RAP portfolio of the 2014 IRP and the Efficiency Plan. Note that the savings presented above are from the RAP portfolio of the Potential Study. The combined potential savings from these programs under the MAP portfolio of the Potential Study would be approximately 111,108 MWh, which is 26 percent of the RAP savings assumed in the 2014 IRP and the Efficiency Plan.

Q. Why were these programs not included in the 2014 IRP?

A. Ameren provides several reasons why these programs were not included in the 2014 IRP. In particular:

- The Residential New Construction and Home Energy Performance programs were deemed to be not cost-effective by the Company. This finding was based upon

EM&V results, which show very low participation and savings levels. (2016-2018 Plan at p. 7).

- The Residential Electronics program has not been offered by Ameren to date. The Company notes that this program was not included in the 2014 IRP because the Potential Study relied upon secondary data sources. (2014 IRP, Chapter 8 at p. 12).

- The Small Business Direct Install program has not been offered by Ameren to date. The Company notes that this program can be challenging with regard to cost-effectiveness; specifically that direct install programs are more costly to administer, and opportunities are limited by more efficiency lighting baselines. Ameren also notes that it "will continue to gather data and analyze alternative program designs." (2014 IRP, Chapter 8 at pp. 98-99).

- The Multi-Family Direct Install and Common Area programs are covered as part of the Energy Efficiency Kits and Low-Income Program as well as the Business Standard program in the 2014 IRP. (Ameren's Response to Sierra Club Data Request No. SC 1-14).

Q. Do you agree with the Company's decision to exclude all of these programs from the 2014 IRP?

A. No, for several reasons. First, most of these programs are standard programs that are offered by many utilities and serve important customer sectors. The authors of the Potential Study specifically chose a set of programs that would offer "an effective and balanced portfolio of energy savings opportunities across all customer segments" (Potential Study at p. 6-1). Some of the programs that were not included in the 2014 IRP

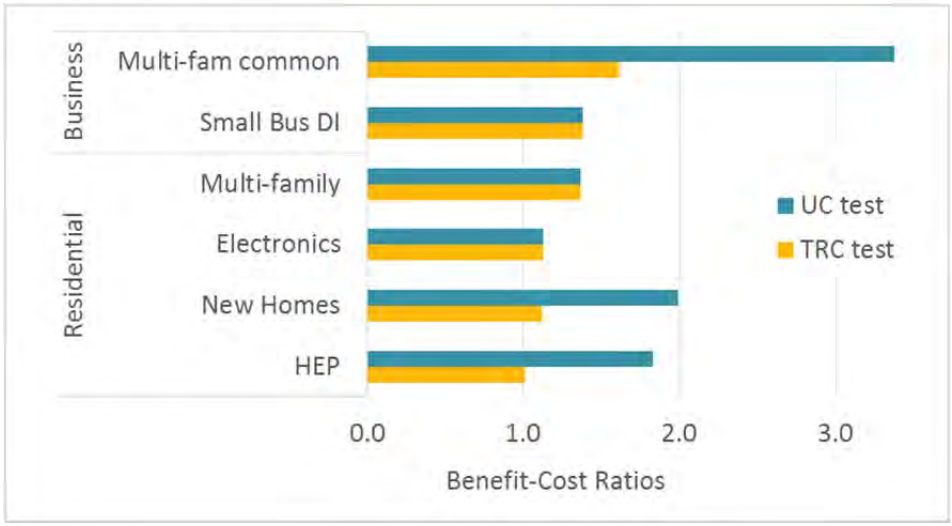
address important customer sectors that will not be adequately addressed by other programs.

- The Residential New Construction program is particularly important because no other program addresses the distinct needs of that market sector, and not continuing with this program will result in significant lost opportunities.
- The Small Business Direct Install program is important because it can serve a large portion of the Company's customers, and this customer sector faces unique and significant market barriers.
- The Company asserts that the Multi-Family Direct Install and Common Area programs will be covered as part of the Energy Efficiency Kits and Low-Income program as well as the Business Standard program. While multi-family buildings may be eligible for these programs, the owners and dwellers in the buildings are not as likely to participate in those programs, due to the unique market barriers associated with multi-family housing.

Second, these programs were found to be cost-effective in the Potential Study. Figure 6.2 presents the cost-effectiveness results from the Potential Study, for both the UCT and TRC test. As indicated, the programs are cost-effective, but the Residential New Construction and HEP programs are only marginally cost-effective under the TRC test, based on the assumptions used in the Potential Study.[14]

[14] Note that the Potential Study does not include the benefits of avoided fossil fuels or water consumption in the TRC test, and therefore underestimates the benefits in the TRC test, as described in Section 5.

Figure 6.2 Cost-Effectiveness Results for Programs Excluded from IRP



(Source: Potential Study, Vol. 3 at p. 6-11).

While it is true that Ameren's EM&V reports have found the Residential New Construction and HEP programs to be uneconomic, this finding requires further investigation before such important programs are eliminated. Why are these programs so uneconomic when other utilities are able to implement them cost-effectively? Has the Company properly accounted for the benefits of the programs, including fossil fuel benefits? Are there marketing and delivery techniques that can be used to increase participation and reduce costs? These questions should be addressed.

Third, the purpose of the IRP is to identify the universe of programs that might be cost-effective under a variety of scenarios. To exclude several important programs at the outset of the IRP process prevents this key inquiry.

Fourth, many utilities consider some of these programs (residential new construction, residential retrofit, small business) to be core programs that must be included in an efficiency portfolio to ensure that all customer sectors are being adequately served. These

utilities continue to offer these programs, despite facing some of the same conditions as Ameren with regard to Federal Standards and reduced avoided costs. A recent study from the American Council for an Energy-Efficient Economy provides several examples of utility best practice programs that could serve as models for the programs that Ameren did not include in the 2014 IRP.[15]

Finally, these programs are important for many reasons that are not captured in the screening tests. They help to avoid lost opportunities by capturing efficiency savings when it is least cost to do so. They help to promote customer equity by serving customer sectors and types that would otherwise be under-served. Continuing certain key programs over time, such as the Residential New Construction and HEP programs, is necessary to maintain continuity, which is important for promoting market transformation, maintaining customer satisfaction, and supporting the state and regional energy efficiency infrastructure and trade allies. For these important policy reasons, Ameren should seek opportunities to make these programs cost-effective.

Q. Are you suggesting that Ameren should implement all of these programs that were in the Potential Study but not in the 2014 IRP?

A. Not necessarily. I do think that all ratepayer-funded energy efficiency portfolios should include a set of core programs that help to overcome key market barriers to all customer types and all market segments, and that in general new construction, home energy retrofit and small business direct install programs should be included among this set of core

[15] Seth Nowak et al., *Leaders of the Pack: ACEEE's Third National Review of Exemplary Energy Efficiency Programs*, American Council for an Energy-Efficient Economy (June 2013). Attached as Schedule TW-3.

programs. However, if there is clear evidence of distinct reasons why some of these core programs should not be implemented, then maybe alternative program approaches should be used to help address those customer types and market segments.

My main point is this: By excluding these programs from the 2014 IRP analysis, Ameren does not investigate certain key opportunities for achieving cost-effective savings. Consequently, the Ameren's MAP portfolio in the IRP and 2016-2018 Plan should not be viewed as the maximum amount of cost-effective energy efficiency achievable, and the RAP portfolio should not be seen as an upper limit on the amount of cost-effective energy efficiency that is realistically achievable.

7. MEEIA AND COST-EFFECTIVENESS

Q. Please summarize your concerns about how Ameren assesses the cost-effectiveness of energy efficiency programs.

A. At the outset, it is important to remember that MEEIA aims to encourage utilities to implement demand side programs proposed "with a goal of achieving all cost-effective demand-side savings." Mo. Ann. Stat. § 393.1075.4. Thus, defining cost-effectiveness properly is critical to achieving the key goal of MEEIA.

I believe that the Company takes an overly narrow view of what is cost-effective and, as a result, dramatically reduces the amount of energy efficiency measures and programs that it proposes to pursue. Ameren relies too heavily on the results of the TRC test to justify the cost-effectiveness of its portfolio of programs, without considering the results of the UCT.

Q. Why do you assert that Ameren should consider the results of the UCT when analyzing the cost-effectiveness of energy efficiency measures and programs?

A. Let me begin by noting that I'm not suggesting that the TRC test result should be ignored. I understand that MEEIA and its implementing regulations state that the TRC is the primary test. However, this does not mean that UCT should be disregarded. In fact, I think MEEIA provides for the opposite. Specifically, the statute states that:

> The commission shall permit electric corporations to implement commission-approved demand-side programs proposed pursuant to this section with a goal of achieving all cost-effective demand-side savings… The commission shall consider the total resource cost test as a preferred cost-effectiveness test. Programs targeted to low-income customers or general education campaigns do not need to meet a cost-effectiveness test, so long as the commission determines that the program or campaign is in the public interest. *Nothing herein shall preclude the approval of demand-side programs that do not meet the test if the costs of the program above the level determined to be cost-effective are funded by the customers participating in the program* or through tax or other governmental credits or incentives specifically designed for that purpose.

Mo. Rev. Stat. § 393.1075.4 (emphasis added).

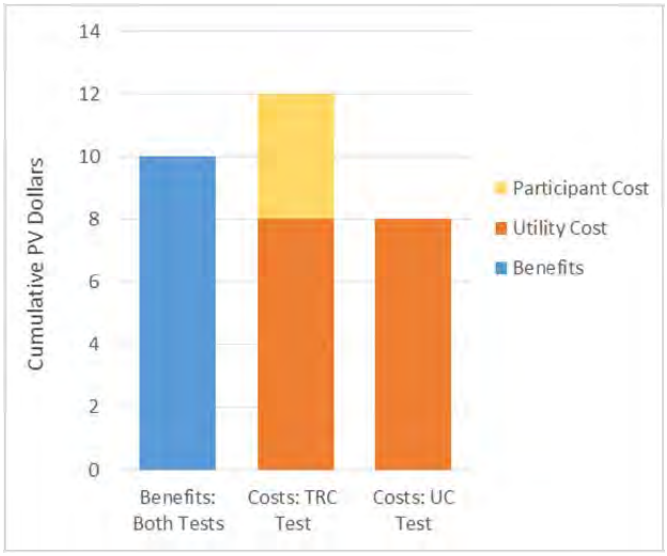
Q. How does this relate to the utility cost test?

A. While I am not a lawyer and am not offering a legal opinion, I note that the primary difference between the TRC test and UCT is that participant costs are included in former test but not the latter. Thus, programs that do not meet the TRC test but pass the UCT generally are programs with costs that are "above the level determined to be cost-effective [that] are funded by the customers participating in the program." Mo. Rev. Stat. § 393.1075.4.

Q. How do the TRC test and UCT differ?

A. Figure 7.1 provides an example to demonstrate the difference between the tests. While the benefits of the two tests are the same for the purpose of this example,[16] the costs differ in that the TRC test considers participant costs and the UCT does not. Given the program benefits of $10 million, the program would be considered cost-effective if the costs are less than that amount. In the absence of the participant cost (in other words, under the UCT), the program is cost-effective. Under the TRC test, however, the program is not cost effective because the total costs exceed $10 million. Thus, this hypothetical efficiency program would not pass the TRC test but would pass the UCT because "the costs of the program above the level determined to be cost-effective are funded by the customers participating in the program."

Figure 7.1 UCT and TRC Costs and Benefits



[16] In practice, the TRC test should also include the benefits associated with fossil fuel savings, as well as the participant non-energy benefits. However, those benefits are not used by Ameren and are not relevant to this example.

This is an important distinction between the two tests and an important clarification of the definition of cost-effectiveness because the benefit-cost ratios of the TRC test are often significantly lower than those of the UCT. This is true for most of the programs in Ameren's 2016-2018 Plan, as indicated in Figure 3.6 above.

Q. How do the MEEIA regulations address the UCT in terms of analyzing the cost-effectiveness of energy efficiency measures and programs?

A. The MEEIA regulations essentially mirror the requirements of the MEEIA statute on this point (4 CSR 240-20.094(3)(C)). In addition, the MEEIA regulations also require electric utilities to report the results of the "utility cost test, the participant test, the non-participant test, and the societal cost test," in addition to the results of the TRC test. (4 CSR 240-3.164(2)(B).2).

Q. Why it is important to account for the results of the UCT when analyzing the cost-effectiveness of energy efficiency measures and programs?

A. The UCT provides very valuable information to determine the cost implications of energy efficiency measures and programs. The UCT includes only those costs and benefits that affect a utility's revenue requirement. Customers pay for this revenue requirement through their electricity bills. This is why the UCT provides the best indication of the extent to which energy efficiency programs and measures can reduce electricity costs and therefore reduce customer bills on average.

Q. What do the results of the UCT indicate for the efficiency programs in the Plan?

A. Figure 3.6 above presents the benefit-cost ratios for each program in the Company's Plan, for both the UCT and the TRC. As indicated, in most cases the programs are significantly

more cost-effective according to the UCT relative to the TRC test. (For several programs the results of the two tests are essentially the same because there is no participant cost.)

Under the TRC test, the portfolio of programs is expected to result in roughly $91 million in cumulative present value benefits, while under the UCT the portfolio is expected to result in roughly $135 million in cumulative present value benefits (2016-2018 Plan, Table 2.6 at p. 20). In other words, the Plan is expected to reduce electricity system costs, revenue requirements, and average customer bills by $135 million, 48 percent higher than the $91 million indicated by the TRC test.

Similarly, under the TRC test, the portfolio of programs is expected to have a benefit-cost ratio of 1.5, while the under the UCT the programs will have a benefit-cost ratio of 2.1 (2016-2018 Plan, Table 2.5 at p. 20). This means that for every ratepayer dollar spent by the Company on energy efficiency, it will be able to reduce ratepayer costs by 2.1 dollars. It also means that for every ratepayer dollar that the Company chooses *not* to spend on energy efficiency, it will forego the opportunity to reduce ratepayer costs by 2.1 dollars.

Q. Does this issue have a more significant effect than just making the proposed programs look more cost-effective?

A. Yes. The most significant problem with using the results of the TRC test to screen resources, without considering the results of the UCT, arises in a way that is much less apparent than what is indicated in Figure 3.6 and the results discussed immediately above. There are many places in the Potential Study, the IRP and the Plan in which Ameren claims that its measures, programs or savings are limited by cost-effectiveness. (*See, e.g.*, 2016-2018 Plan at pp. 7, 26-27; 2014 IRP, Chapter 8 at p. 98; Potential Study

at p. 6-2). In many of these cases, the cost-effectiveness screen is based on the results of the TRC test, and the Company does not even report the results of the UCT. One of the clearest cases where this arises is in the Potential Study. As described above in Section 5, the Potential Study notes that the most significant difference between the measure-level savings and the programs level savings is the assignment of program and portfolio costs which makes certain measures uneconomic. As indicated in Figure 4.2, this dramatically reduces the estimates of program level savings. In cases such as this, the Company may be eliminating large amounts of measures and programs that could be considered cost-effective under the UCT, without even considering or reporting those results.

Q. Does Ameren consider the results of the UCT in other contexts?

A. Yes. Ameren uses minimization of the PVRR as its primary selection criterion in its IRP process (2014 IRP at p. 10-3). This is consistent with Missouri rules on electric utility resource planning (4 CSR 240-22.010(2)(B)), as well as standard industry practice.

As I mentioned above, the benefits and costs included in the UCT include only those impacts related to revenue requirements. Therefore, the goal of minimizing PVRR is essentially the same as the goal of implementing all cost-effective efficiency programs as defined by the UCT.

Thus, considering the results of the UCT in defining cost-effectiveness is consistent with the IRP portfolio selection process. However, there are two problems with the Company's methodology in this regard. First, the Potential Study uses a much narrower screen of the TRC test, thereby preventing many efficiency measures and programs from even reaching the IRP. Second, the Company did not even adhere to the practice of

selecting the efficiency portfolio on the basis of the UCT when it chose the RAP portfolio over the MAP portfolio for the Preferred Resource Plan.

8. RECOMMENDATIONS

Q. Given your extensive review of the Ameren's 2016-2018 Plan and Ameren's underlying analyses, what do you recommend with regard to proposed Plan?

A. I recommend that the Commission approve the Efficiency Plan on the condition that Ameren commit to modify its Plan to achieve greater efficiency savings during the 2016-2018 period. These increased savings can be achieved through a combination of the following:

- Maintaining some programs that are proposed to be terminated; for example, the Residential New Construction and HEP programs;
- Adding programs that have not been implemented and are not yet a part of the proposed Efficiency Plan; for example, a Small Business Direct Install, and a Street Lighting program;
- Modifying existing program designs to increase customer adoption; for example, through increased use of upstream buydown practices for lighting products, HVAC measures, and certain efficient appliances; and
- Expanding program budgets to increase participation rates for programs serving key customer segments.

In particular, Ameren should increase the efficiency savings in its Plan to reach the MEEIA energy savings guidelines for 2016 (1.1 percent), 2017 (1.3 percent) and 2018 (1.5 percent).

There are several reasons that I recommend these savings as a reasonable and realistic target for Ameren: (a) the Company has already achieved efficiency savings roughly equal to one percent in 2014; (b) the efficiency savings in the 2013-2015 Efficiency Plan are slightly above the MEEIA energy savings guidelines, and the reported savings for 2013 and 2014 are higher than what was planned; (c) Ameren should be considering at least these levels of efficiency savings for the purpose of complying with federal greenhouse gas requirements in the lowest-cost way; and (d) many states have already achieved these levels of efficiency savings, even in recent years with federal appliance standards in place and lower avoided costs. I am confident that the MEEIA savings guidelines can be achieved with cost-effective efficiency savings, based upon my review of the Company's Plan and the opportunities described above for expanded efficiency savings.

In addition, I recommend that the Commission direct Ameren to explore the use of all cost-effective energy efficiency resources as a means of mitigating the costs of complying with future federal greenhouse gas regulations. Specifically, in future IRPs and Energy Efficiency Plans, the Company should (a) make more realistic assumptions about the likelihood of such regulations over the long-term, and (b) investigate a wide range of increased energy efficiency programs as alternatives to other options to comply with those regulations.

Q. What do you recommend with regard to the efficiency tests used to determine energy efficiency cost-effectiveness?

A. I recommend that the Commission direct Ameren to present and consider the results of the utility cost test in all future energy efficiency analyses, including potential studies, IRPs, and energy efficiency plans. These results should at least be considered as part of the decision as to which efficiency programs are cost-effective.

Q. Do you have any recommendations regarding Ameren's request for variances from the MEEIA regulations?

A. I have a recommendation regarding one of Ameren's requests for a variance.[17] The Company has asked for a variance from 4 CSR 240-20.094(1)(A), 4 CSR 240-20.094(3)(A) and 20.094(4)(A), which refer to annual demand and energy savings targets. Ameren seeks the flexibility to modify the demand and energy savings targets during the course of the 2016-2018 Plan. Specifically, Ameren seeks the flexibility to modify the energy savings targets used to determine the performance incentive included in the DSIM as efficiency programs are added or removed, and to adjust the targets based on updated values in the TRM.

I do not support this variance from the MEEIA regulations. This variance would provide Ameren with too much flexibility to modify energy savings targets without sufficient oversight by the Commission or input from stakeholders. It also creates too much

[17] My silence on the other requests for variances should not be interpreted as support for, or opposition to, them.

uncertainty with regard to the level of efficiency savings to be achieved over time and the magnitude of the performance incentive.

Q. Does this conclude your direct testimony?

A. Yes, it does.